Abstracts

On the Relationship Between Schottky Barrier Capacitance and Mixer Performance at Cryogenic Temperatures

R.R. Romanofsky. "On the Relationship Between Schottky Barrier Capacitance and Mixer Performance at Cryogenic Temperatures." 1996 Microwave and Guided Wave Letters 6.8 (Aug. 1996 [MGWL]): 286-288.

The flat-band voltage is the Schottky junction voltage required to shrink the depletion width to zero. At cryogenic temperatures, mixer diodes are generally biased and/or pumped beyond the flat-band condition to minimize conversion loss and noise figure. This occurs despite the presumed sharp increase in junction capacitance near flat-band, which should instead limit mixer performance. Past moderate forward bias, the diode C-V relationship is difficult to measure. A simple analytic expression for C(V) is usually used to model and predict mixer performance. This letter provides experimental data on C(V) at 77 K based on a microwave measurement and modeling technique. Data is also provided on the conversion loss of a singly balanced mixer optimized for 77 K operation. The connection between junction capacitance, flat-band potential, and conversion loss is examined. It is shown that the analytic expression greatly overestimates the junction capacitance that occurs as flat-band is approached.

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